What is claimed is:

1. A process to deposit a thin film on a device by chemical vapor deposition, comprising:

   a. exposing the device to a gaseous first reactant, wherein the first reactant deposits on the device to form a first layer that can be other than a monolayer;

   b. performing a plasma treatment on the deposited film;

   c. exposing the device, with the first layer deposited, to a gaseous second reactant under the plasma treatment to deposit the gaseous second reactant; and

   d. repeating steps (a) and (c) until the thin film, comprising a plurality of layers, is deposited.

2. The process of claim 1, wherein the device is a wafer.

3. The process of claim 1, wherein the plasma treatment is capable of at least one of enhancing and maintaining at least one of conformality and density of the thin film.

4. The process of claim 1, wherein the plasma is a high density plasma with greater than 5×10^9 ion/cm^3.

5. The process of claim 1, wherein at least one of the gasous first reactant and the gaseous second reactant comprises a metal organic reactant.

6. The process of claim 1 wherein at least one of the gaseous first reactant and the gaseous second reactant comprises a metal organic reactant.

7. The process of claim 1, wherein one of the reactants comprises an organic reactant.

8. The process of claim 1, wherein the thin film comprises a metal film.

9. The process of claim 1, wherein the thin film is selected from the group consisting of a metal nitride film and a metal oxide film.

10. The process of claim 1, wherein exposing the device, with the first layer deposited, to the second reactant occurs under pressure above one hundred militorr (100 mT).

11. The process of claim 1, further comprising pressurizing the chamber to a pressure above one hundred militorr (100 mT).

12. The process of claim 11, wherein reacting the first reactant and second reactant creates a new compound.

13. The process of claim 1, wherein the thin film thickness is between a fraction of a nanometer and ten nanometers.

14. The process of claim 1 further comprising exciting the plasma with a solid state RF plasma source.

15. The process of claim 15 wherein the process further comprises using a helical ribbon electrode as the solid state RF plasma source.

16. The process of claim 1, further comprising sequentially pulsing the plasma for each layer to be deposited.

17. The process of claim 1, further comprising purging a chamber of the first reactants.

18. A process to deposit a thin film by chemical vapor deposition, comprising:

(a) pre-cleaning a surface of a device;

(b) evacuating a chamber of gases;

(c) exposing the device to a gaseous first reactant in the chamber, wherein the first reactant deposits on the device to form a layer having a thickness of other than a monolayer;

(d) evacuating the chamber of gases;

(e) striking a plasma;

(f) exposing the device, coated with the first reactant, to a gaseous second reactant under the plasma so that the layer deposited by the first reactant is treated; and

(g) repeating steps (c)-(f) until the thin film comprising a plurality of layers is deposited.

19. An apparatus to perform nano-layer deposition, comprising:

an inductively coupled plasma generator; and

a process chamber, in which to expose a device to a gaseous first reactant, wherein the first reactant deposits on the device to form a layer having a thickness of more than a monolayer, and wherein the chamber is used to expose the device, coated with the first reactant, to a gaseous second reactant under a plasma, so that the layer deposited by the first reactant is treated.

20. A process to deposit a thin film including a plurality of layers on a device by chemical vapor deposition, the process comprising:

a. exposing the device to a gaseous first reactant, wherein the first reactant deposits on the device to form a layer;

b. exposing the device, coated with the first reactant, to a gaseous second reactant under a plasma treatment, wherein the plasma treatment is generated with a solid state RF plasma source having a helical ribbon electrode, and wherein the layer deposited by the first reactant is treated; and

c. repeating steps (a)-(b) until the thin film comprising a plurality of layers is deposited.

21. An apparatus to perform nano-layer deposition ("NLD"), comprising:

an inductively coupled solid state RF plasma source that can generate a plasma, the plasma source comprising a helical ribbon electrode and a generator; and

a process chamber associated with the plasma source, wherein a device is exposed to a gaseous first reactant in the chamber, so that the first reactant deposits on the device to form a layer, and wherein in the chamber of gases, the device, coated with the first reactant, is exposed to a gaseous second reactant under plasma, to treat the layer deposited by the first reactant.

22. An apparatus to perform nano-layer deposition, comprising:

an inductively coupled solid state RF plasma source that can generate a plasma, the plasma source comprising a helical ribbon electrode and a generator; and

a process chamber associated with the helical ribbon electrode, the chamber adapted to enclose a device to be exposed to a gaseous first reactant, the first reactant for forming a layer on the device, the chamber further adapted to be purged of the first reactant, and to accept a second reactant under plasma to treat the device coated with the first reactant.

23. An improved process to deposit a thin film on a substrate, the improvement comprising successively depositing a plurality of layers made of at least one reactant selected from the group consisting of metal organic, organic, metal, metal nitride, and metal oxide, with each of said layers being greater than one atomic layer thick.

24. An improved method of thin film processing, the improvement comprising depositing multiple atomic layers for each exposure to a reactant for high throughput processing.

25. An improved method for thin film processing, the improvement comprising using nano-layer deposition to create a nanocrystalline grain structure in an amorphous matrix.

26. An improved method for semiconductor thin film processing, the improvement comprising incorporating in a plasma excitation circuit a helical ribbon electrode adapted to enhance the plasma uniformity.

27. A method for processing a thin film onto a semiconductor wafer, the method comprising:

exposing a wafer in a chamber with a first gaseous reactant;

coating the wafer with the first reactant so that a first coat of the first reactant is greater than one monolayer in thickness;

evacuating the chamber;

exposing the coated wafer to a gaseous second reactant as a plasma; and

forming a second coat over the first coat, the second coat being greater than one monolayer in thickness.

28. The method as in claim 27 wherein the method further comprises successively adding at least one additional coat by repeating the evacuating step, the second exposing step, and the forming step.

29. The method as in claim 27 wherein the method further comprises exciting the plasma with a solid state RF plasma source functionally associated with the chamber.

30. The method as in claim 27 wherein the exciting step uses a helical ribbon electrode, as the solid state RF plasma source.

31. The method as in claim 27, wherein the plasma has a density higher than 5×10^9 ion/cm^3.

32. The method as in claim 27 wherein the method further comprises performing the second exposing step under pressure above 100 mT.

33. The method as in claim 27 wherein the second exposing step and subsequent forming step further comprise reacting the first coat of the first reactant with the second coat of the second reactant to form a different chemical product.

34. The method as in claim 27 wherein the method is unaffected by self-limiting surface reactions of the first coat and second coat.

35. The method as in claim 28 wherein the method is unaffected by self-limiting surface reactions of the first coat, the second coat, and the at least one additional coat.

36. The method as in claim 27 wherein the method further comprises carrying out the method using a multi-chamber processing system that is adapted to receive and process a plurality of wafers, wherein the wafers are transferred to different chambers.

37. A method for processing a thin film onto a plurality of semiconductor wafers using a multi-chamber processing apparatus, the method comprising:

loading the plurality of wafers into a first area of the apparatus;

evacuating the first area;

delivering the plurality of wafers to a second chamber;

transferring at least one wafer to a third chamber for processing;

processing the at least one wafer by exposing the at least one wafer in the third chamber to a first gaseous reactant;

coating the at least one wafer with the first reactant so that a first coat of the first reactant is greater than one monolayer in thickness;

evacuating the third chamber;

exposing the coated wafer to a gaseous second reactant as a plasma; and

forming a second coat over the first coat, the second coat being greater than one monolayer in thickness.

38. The method as in claim 37 wherein the loading step places the plurality of wafers into a load lock.

39. The method as in claim 37 wherein the delivering step places the plurality of wafers into a transfer chamber.

40. The method as in claim 37 wherein the transferring step comprises purging the transfer chamber during transfer of at least one of said plurality of wafers during transfer from a transfer chamber to a processing chamber.

41. The method as in claim 37 wherein the the delivering step comprises purging the transfer chamber during transfer of at least one of said plurality of wafers from a loading lock to a transfer chamber.

42. An apparatus for semi-conductor thin film processing, the apparatus comprising:

a plasma excitation circuit driven by an inductively coupled plasma generator; and

a processing chamber functionally associated with the plasma excitation circuit, wherein the processing chamber is sealed for successively processing a substrate a plurality of times with at least one species of gas.

43. An apparatus as in claim 42 wherein the plasma excitation circuit further comprises a helical ribbon electrode.

44. An apparatus as in claim 43 wherein the helical ribbon electrode is connected with a generator; the helical ribbon electrode rests above a dielectric wall; and the dielectric wall rests above the chamber and is supported by at least one chamber wall, wherein the dielectric wall allows energy from the generator to pass through a plasma inside the chamber.

45. An apparatus as in claim 44 wherein the dielectric wall is made from a material selected from the group of non-metallic materials comprising ceramics, glass, quartz or plastic.

46. An apparatus as in claim 44 wherein the helical ribbon electrode is connected with a generator and the helical ribbon electrode is positioned inside the chamber.

47. An apparatus as in claim 46 wherein the generator drives the helical ribbon electrode via an electrical feed.

48. An apparatus as in claim 43 wherein the helical ribbon electrode is connected with a generator; the helical ribbon electrode is wrapped around a tubular dielectric wall; and the chamber is positioned within the helical ribbon electrode and the tubular dielectric wall.

49. An apparatus as in claim 45 wherein the distance between the helical ribbon electrode and the substrate is less than 5 inches.

50. An apparatus as in claim 49 wherein the chamber is elongated with a vertical axis of the chamber less than a horizontal axis of the chamber.

51. The apparatus as in claim 43 wherein the helical ribbon electrode includes a coil, and said coil has between 3 to 10 turns.

52. The apparatus as in claim 43 wherein the helical ribbon electrode is made of a conductive ductile metal.

53. The apparatus as in claim 52 wherein the conductive ductile metal is copper.

54. The apparatus as in claim 52 wherein the conductive ductile metal is aluminum.

55. The apparatus as in claim 51 wherein a width of the coil is greater than a thickness of the coil.

56. The apparatus as in claim 55 wherein a ratio of the width to the thickness of the coil is at least 100:1.

57. The apparatus as in claim 55 wherein a ratio of the width to the thickness of the coil is between 100:1 to 10,000:1.

58. The apparatus as in claim 43 wherein:

the helical ribbon electrode includes a conductive coil;

the coil has a plurality of turns;

the helical ribbon electrode is compressed so that each of the plurality of turns of the coil has a top flat surface and a bottom flat surface; and

the coil is insulated by a plurality of sheets of a dielectric material wherein a width of the coil is smaller than a width of the dielectric sheet, and one surface of each of the turns of the compressed coil engage one side of one of the plurality of the dielectric sheets.

59. An apparatus as in claim 42 wherein the plasma excitation circuit further comprises an external electrode selected from the group consisting of capacitance coupling type and inductance coupling type.

60. An apparatus as in claim 42 wherein the apparatus includes a heat exchanger adapted to remove heat from the plasma excitation circuit during operation.

61. An apparatus as in claim 42 wherein the plasma generator is functionally associated with a controller, wherein the controller generates a periodic pulse, to control on/off plasma generation.

62. An apparatus for semi-conductor thin film processing having a plurality of chambers, the apparatus comprising:

a plasma excitation circuit driven by an inductively coupled plasma generator;

a load lock to flush ambient air from at least one wafer to be processed in the apparatus;

a transfer chamber for receiving the at least one wafer from the load lock; and

a processing chamber that receives the at least one wafer from the transfer chamber, the processing chamber also being functionally associated with the plasma excitation circuit, wherein the processing chamber is sealed for successively processing the at least one wafer a plurality of times with at least one species of gas.

63. The apparatus of claim 62 further comprising a first slit valve between the load lock and the transfer chamber.

64. The apparatus of claim 62 further comprising a second slit valve between the transfer chamber and the processing chamber.

65. The apparatus of claim 62 wherein the load lock further comprises an air circulation and filtration system to flush the ambient air surrounding the at least one wafer.

66. The apparatus of claim 62 wherein the load lock further comprises at least one pressure sensor.